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ABSTRACT

A recent master's level course in the Department of Educational Administration and Foundations at Illinois State University pushed the envelope on using instructional Internet technologies. This course utilized several in-person sessions (both on- and off-campus), e-mail, and a dedicated World Wide Web site. The majority of classes were held over the Internet using CU-SeeMe client and server software. Certain experiences (e.g., installing and configuring new software, training students to use the software, and back-up methods of instruction) were anticipated, while others had to be dealt with "on the fly" (e.g., incompatible hardware, Internet propagation delays, and synchronizing audio and video). Instructors contemplating this mode of content delivery need to be aware of the benefits and costs, especially in terms of time for instructor and student training, multiple modality and error-alternative preparation, and practice. The following conclusions are presented: (1) instructors and students need a lot of time to become familiar with the technology; (2) instructors need to plan for the unexpected and have alternative and backup methods for delivering course content; (3) instructors need to create multiple/repetitive modes of content delivery; and (4) instructors and students need to be relatively technically savvy as well as highly fault tolerant. (AEF)

Bleeding on the Edge: Experiences from Teaching a Multimedia-Rich Course over the Internet

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Abstract

A recent master's level course pushed the envelope on using instructional Internet technologies. This course utilized several in-person sessions (both on- and off-campus), extensive use of e-mail, and a dedicated web site. The majority of classes were held over the Internet using CU-SeeMe client and server software. Certain experiences (e.g., installing and configuring new software, training students to use the software, and back-up methods of instruction) were anticipated, while others had to be dealt with on the fly (e.g., incompatible hardware, Internet propagation delays, and synchronizing audio and video). Instructors contemplating this mode of content delivery need to be aware of the benefits and the costs, especially in terms of time for instructor and student training, multiple modality and error-alternative preparation, and practice.

Background

The Department of Educational Administration and Foundations, a graduate-level unit of the College of Education at Illinois State University, has as one of its primary missions the preparation of educational leaders in public schools. Accomplishing this mission often requires teaching courses off campus. One off-campus cohort draws students from a school district located in the town of Wheeling, Illinois, approximately three and one-half hours drive from campus. The distance from campus made weekly travel impractical. Intensive, multi-day weekend sessions were examined although some courses do not adapt well to this delivery format. Dedicated-line compressed video is a popular alternative, except that the district did not have the facilities for a remote site connection. Neither were facilities available for delivery via satellite. Asynchronous Internet-based (web) instruction has been used in other subject areas, although there was some concern about teaching a master's level, research and statistics class solely asynchronously. Compressed two-way audio and video over the Internet had been used experimentally, but never as a primary means of delivering instruction. *Could this new technology be used for primary instruction for this off-campus group?*

By mid-summer of 1997 the necessary software (Cu-SeeMe version 3 and Reflector version 2.1) were purchased and installed at both the University and on three computers at the school district. The Instructor's computer was a Dell XPS/H266, and Pentium-II class computer with a 266Mhz processor, 64Mb of memory, a 21" monitor with 4Mb of video RAM, and a high-speed token rink connection to the Internet running under Windows 95. A Panasonic Egg-Cam was used to capture the live video and audio, while a sound card built into the computer provided audio to the stereo speakers. The reflector software as run on a Dell XPS/H233 machine, a Pentium-II class computer with a 233Mhz processor, 64 Mhz of memory, a standard monitor with 2Mb of video RAM, and a high-speed token ring connection running Windows NT version 4. Three computers were purchased for the district – all were Hewlett-Packard Vectra machines; however, these machines proved incompatible with the then-available Panasonic Egg-Cam and had to be replaced with functional clone computers. These machines were Pentium 133Mhz computers with 32Mb of RAM and 15" SVGA monitors, each having an audio board, speakers, and Panasonic Egg-Cam.

The first task facing the instructor was the setup, installation, and testing of the various hardware and software components. Different transmit and receive bandwidths, audio and video codecs, and connections strategies were experimented with over the course of almost two months of trials. During the same time the instructor was reformatting courseware for this new model of delivery. To facilitate the evaluation of this course the instructor kept a daily diary, recording his observations and experiences. Students were encouraged to e-mail the instructor detailing their impressions, as were the technical staff assisting with the project. These written records, along with the materials developed for and used in the course, were examined as the record of the course activities.

Results

The class began in mid-August of 1997 with two days of on-campus orientation sessions. During this time students were introduced to the technology of CU-SeeMe, along with a review of basic computer operations and WWW/e-mail over the Internet. Students also received the first six hours of content instruction in the research and statistics course. Three weeks later the first class over the Internet using CU-SeeMe was held. Technical problems with the Hewlett-Packard computers

prevented the students from utilizing all three computers, with the result that all of students had to crowd around a single screen. A projection system was hastily put together, although the degree of class interaction initially suffered since the instructor was unable to see or hear all of the students in the class. When the HP machines were later replaced with other, compatible computers this problem went away, and later sessions were able to utilize all three student computers (with three to four students sharing a computer) running simultaneously.

Start-up problems continued to abound, however. Early sessions were plagued with difficulties in transmitting audio, and many times the back-up system of a speaker telephone (and long-distance call) had to fill in for the non-transmitting audio (even though this put the audio badly out of sync with the video). While several computers could be placed in one room to receive and send video, out-of-sync audio necessitated that only one machine be used for sending or receiving audio. During one class the server crashed, resulting in a 15 minute break while the server was rebooted and the reflector software reinitialized. Another session had to be canceled entirely when an MCI telephone switching node, located between the campus and school district, was experiencing difficulties and holding packets in excess of 400 milliseconds. [NOTE: while this might not sound like a long time it dramatically degraded the audio and video transmissions to the point where neither was intelligible.] One session was ended early when the Whiteboard application, which had been running perfectly for almost two hours, crashed right before the final example was to be completed.

By the end of the fourth month operations were running relatively smoothly. Reliable connections could be established between the university and the school district, and audio and video were configured to allow reasonable communications under almost every network circumstance. Although minor software glitches continued to occasionally crash programs (or disconnect computers from the conference) the instructor and students had learned to take these problems in stride, rebooting the computer and/or application or reconnecting the computer with only minimal downtime. The simultaneous chat window proved to be quite useful, with students able to ask questions of the instructor without interrupting the flow of a lecture or discussion. To manage the instructor had to learn to respond (by typing or in voice) to these queries while continuing with a simultaneous audio and video presentation! It was observed that chat was used as frequently for content related needs (e.g., "what was the web address again", or "could you give us an example of what you just said") as for non-content related needs (e.g., "the audio is too low", or "I will miss class next week").

Conclusions

1. *Both instructors and students need a lot of time to become familiar and comfortable with the technology – hardware and software – used in this kind of distance education.* The initial orientation session was critical, although we found that additional time still needed to be spent throughout the course to refresh and expand knowledge.
2. *Instructors need to plan for the unexpected, and have alternative and backup methods for delivering course content in the event of a failure of the primary method.* The speakerphone provided an instant link between the university and the district, critical at the start of each session and when technical glitches severed the connection. Having additional session dates and times written into the syllabus, as well as alternative modes of information presentation (whether over a web site or in person) provided flexibility not normally found in the typical college class.

3. *Instructors need to create multiple and repetitive modes of content delivery.* We discovered, for example, that CU-SeeMe was not an appropriate vehicle for delivering videotaped presentations. While the program could handle this type of input it would often fail to keep audio and video synchronized. Rather than deliver videos using CU-SeeMe it was decided to encode the videos for streaming presentation from the web site. Real Media's video encoder and plug-ins for Netscape and Internet Explorer provided a more reliable means of video presentation to the remote class. Likewise, content shown on the Whiteboard was mirrored (using PowerPoint shows) on the web site, providing students a secondary means of viewing this content and protecting against unexpected program or system failure during class.
4. *Finally, the current state of this technology requires that potential instructors and students be relatively technically savvy as well as highly fault tolerant.* The emergent nature of these new technologies, together with the unpredictability of the Internet (and, in some cases, the unexpected failure of software components) will require a need for the instructor to be able to think and act relatively quickly. Although not yet mature enough, in our opinion, to be relied upon as the sole means of distance education instruction, Internet-based audio and video conferencing can fill a developing niche for off-campus student needs.

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